

# Adaptive Linear Parameter Varying Control for Aeroservoelastic Suppression, Phase I

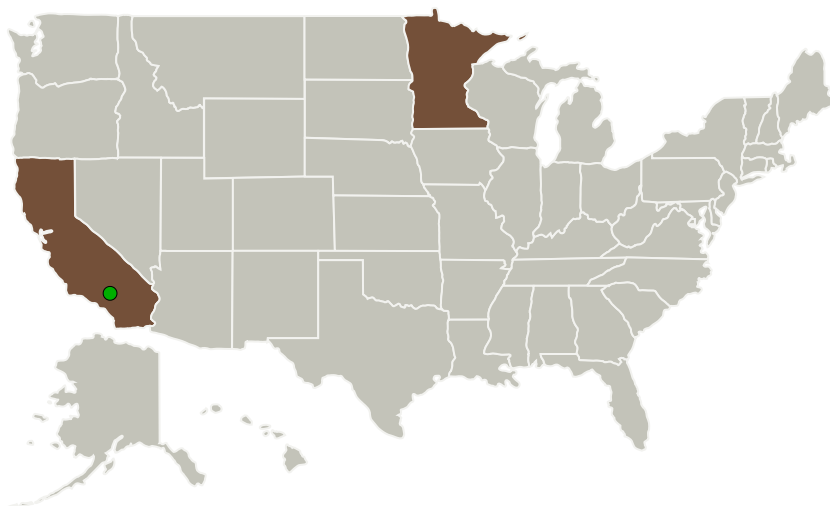
Completed Technology Project (2011 - 2011)



## Project Introduction

Adaptive control offers an opportunity to fulfill present and future aircraft safety objectives through automated vehicle recovery while maintaining performance and stability requirements in the presence of unknown or varying operating environment. Future aircraft are a natural application of adaptive control. These aircraft will be more fuel efficient, have longer operating ranges through more flexible aircraft structures. This increased flexibility will result in structural modes being in the same frequency range as the rigid body modes. The traditional non-adaptive control design approach to address the aeroservoelastic (ASE) interaction of decoupling the rigid body and structural dynamics will not work. Furthermore, the application of adaptive control to these flexible aircraft may result in undesired ASE excitation leading to structural damage or failure. Hence an integrated flight control system is needed for gust load alleviation, flutter suppression and rigid body control of the aircraft which works in concert with the adaptive control system for improved resilience and safety. MUSYN proposes an integrated approach based on linear, parameter-varying (LPV) control to the design of the flight control, load alleviation and flutter suppression algorithms. The Phase I and Phase II research will focus on applying and extending LPV techniques to model, design, analyze and simulate control algorithms for flexible aircraft. The objective is to combine the integrated LPV flight control system with adaptive control to preserve rigid body performance during upsets while retaining the load alleviation and flutter suppression characteristics of the nominally augmented aircraft. Phase I will develop a prototype LPV framework for modeling, analysis, control and simulation and Phase II will develop a comprehensive LPV software tool suite.

## Primary U.S. Work Locations and Key Partners



Adaptive Linear Parameter Varying Control for Aeroservoelastic Suppression, Phase I

## Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	3
Technology Areas	3
Target Destinations	3

## Adaptive Linear Parameter Varying Control for Aeroservoelastic Suppression, Phase I

Completed Technology Project (2011 - 2011)



Organizations Performing Work	Role	Type	Location
MUSYN Inc	Lead Organization	Industry	Minneapolis, Minnesota
● Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California

Primary U.S. Work Locations	
California	Minnesota

## Project Transitions

▶ **February 2011:** Project Start

✓ **August 2011:** Closed out

**Closeout Documentation:**

- Final Summary Chart(<https://techport.nasa.gov/file/140157>)

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

MUSYN Inc

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

**Principal Investigator:**

Peter Seiler

**Co-Investigator:**

Peter Seiler

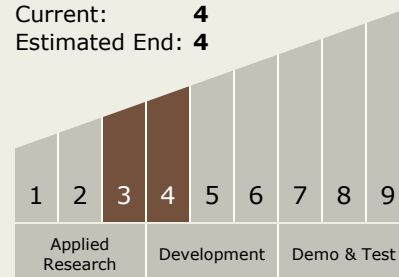
# Adaptive Linear Parameter Varying Control for Aeroservoelastic Suppression, Phase I

Completed Technology Project (2011 - 2011)



## Technology Maturity (TRL)

Start: **3**  
Current: **4**  
Estimated End: **4**



## Technology Areas

### Primary:

- TX15 Flight Vehicle Systems
  - └ TX15.1 Aerosciences
    - └ TX15.1.3 Aeroelasticity

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System